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ST. PATRICK'S CATHEDRAL, DUBLIN.

[Choir of St. Patrick's Cathedral.]

The metropolis of Ireland is celebrated for the beauty of its public buildings; and the Bank, the College, the Four Courts, the Custom-House, the Stamp-Office, the Post-Office, the Royal Exchange, the new Catholic church of St. Mary's, and other edifices, well sustain its claim to be accounted one of the finest cities in the United Kingdom. The architectural ornaments, however, of which it has most reason to be proud are almost all modern. Of ancient Gothic magnificence, of which England has so much to show, there are few remains either here or anywhere else in Ireland. St. Patrick's Cathedral is, we believe, the most remarkable structure in the Gothic style now to be found in the country.

Dublin possesses two cathedrals, of which that dedicated to the Holy Trinity, and commonly called Christ's Church, enjoys the priority in point of dignity. It is a very old building, and is now in a state of extreme decay. Both the Cathedral of Christ's Church and that of St. Patrick stand on the south side of the river Liffey, in the south-west quarter of the city, which is the most ancient part of it. Christ's Church is nearest the river, and St. Patrick's stands directly south from it. The situation of the latter is very low, and it is not a great many years since not only the floor of the cathedral, which is sunk six or seven feet below the surrounding streets, used occasionally to be inundated, but even outside the walls the water sometimes stood so high that boats actually plied on it. Draining and other improvements have now, however, put an end to these inconvenient visitations.

The site appears to have owed its first reputation for sanctity to a well, long known by the name of the patron saint of Ireland. A church dedicated to St. Patrick is said to have been built on the site which the cathedral now occupies, so early as the middle of the fifth century; —but there probably was little church building in Ireland till some centuries after this date. There is no reason to doubt, however, that there was a church here when Archbishop John Comyn conceived the plan of erecting the present more extensive building about the close of the twelfth century. The new church of St. Patrick was at first only a collegiate church; it was not till the episcopacy of Henry de Loundres (that is, of London), who was consecrated archbishop in 1213, that it was made a cathedral, and "united," says John Alan, who was archbishop in the time of Henry VIII., "with the Cathedral of the Holy Trinity, saving to the other church the prerogative of honour *."

This, however, was, properly speaking, only the predecessor of the present building. On the 6th of April, 1362, the church which had been erected by Archbishop Comyn was burned to the ground, the blame of which is thrown upon the negligence of John the sexton. In 1364 the restoration of the edifice was begun by Thomas Minot, the then archbishop; and the work was probably completed before the end of the fourteenth century. Minot is known to have laid, in the year 1370, the foundation of the present tower, which rises over the intersection of the nave and transept, and to have lived to finish it according to the original design. The spire by which it is ornamented was only added about the middle of the last century. Archbishop Minot commemorated his pious work by assuming on his seal the somewhat strange device of a bishop holding in his hand a church steeple.

Both time and the hand of man had grievously defaced the original features of St. Patrick's Cathedral, and the building appeared to be hastening to ruin, when, fourteen or fifteen years ago, principally through the exertions of the late Dr. Keating, the dean, the funds were obtained for a thorough reparation of it, which has since been executed. It has now been put into such a state that it may last for some ages. Not only the cathedral itself has been renovated externally and in the interior, and the parts of it which were partially or wholly in ruins restored, but many surrounding old buildings, by which it used to be incumbered and disfigured, have been cleared away.

According to the measurements given in Warburton and Walsh's 'History of Dublin,' this cathedral is 300 feet long and 80 feet in breadth. The transept is 157 feet from north to south; but neither of the two portions which extend beyond the nave forms a part of the cathedral, that to the south being the Chapter House, and that to the north the parish church of St. Nicholas. The latter was in ruins before the recent reparation. For the purpose of enlarging the choir, also, which appears to have been originally only 60 feet long, the central portion of the transept has been taken in from the nave, making the length of the choir now 90 feet. To the east of the choir is the Chapel of the Virgin, the length of which is 55 feet. The nave is stated, by the authority referred to above, to be 130 feet in length; but these numbers leave part of the 300 feet given as the entire length of the church unaccounted for. The account, also, of the width of the several divisions of the nave does not seem to correspond with the statement of its entire width already quoted. The central portion is said to be 30 feet, and each of the two side aisles 14 feet wide. The aisles are separated from the centre by rows of octagonal pillars, each of which is 5 feet in diameter, and 10 feet high. The height of the tower and spire together is 223 feet; of which 120 feet is the height from the ground to the base of the spire.

The interior of the cathedral has not much architectural beauty to boast of; but the wooden roof of the nave, which is lofty, presents a somewhat fanciful design, and the arch, spanning the original entrance to the choir, has been much admired. The roof of the choir, also, is handsome. It was originally of stone, but an imitation in stucco has been substituted, the weight of the stone having been thought too great for the strength of the walls. With these exceptions, the chief ornaments of the church consist of monuments and other accessories. The choir presents a striking appearance, ornamented as it is with the banners of the Knights of St. Patrick, which are suspended over the stalls appropriated to the several members of the order. The installation of the knights takes place in this cathedral; and the banners, helmets, and swords of the deceased knights are preserved in the Chapter House. In the Chapter House is also to be seen the skull of the great Duke of Schomberg, who was killed at the battle of the Boyne, by a shot, as is generally supposed, accidentally fired from his own side. In many of the accounts of the battle it is stated that the ball passed through his neck; but it appears to have entered the head above the right eye. Among the monuments in the choir, by far the most conspicuous is that erected in 1631 in honour of Richard, the first Earl of Cork, and his countess, upon which are sculptured these noble persons, and no less than fourteen other individuals of their family. The display is a very gaudy one, decorations in wood, painted and gilt, being intermixed with the stone. This singular testimonial, erected while the earl was yet alive, is said to have been placed originally behind the communion-table, from which situation it was removed to the south side of the choir, where it now stands, by order of the Earl of Strafford, an exertion of authority which the Earl of Cork avenged by a course of determined hostility to the government of Strafford, and finally by presenting himself as one of the witnesses against that unfortunate nobleman on the trial which ended in his destruction. But the most interesting monumental record in St. Patrick's Cathe-

* See 'History of Dublin,' by Warburton, Whitelaw, and Walsh. 2 vols., 4to., 1818.

dral is a marble slab affixed to one of the pillars in the nave of the church over the remains of Swift, its illustrious dean. He held this dignity from 1713 till his death, on the 19th of October, 1745. The short Latin inscription, written by himself, contains a keen expression of what he probably intended to be taken for a lofty scorn of human folly and vice, but which was really in great part merely a misanthropic impatience generated by disappointed ambition: Here, it is said, rests his body, "ubi sæva indignatio ulterius cor lacerare nequit,"—where bitter indignation can tear his heart no more. His bust, which is said to be a good likeness, is placed over the tablet. On the next pillar hangs a similar plain memorial of the unfortunate Mrs. Hester Johnson, better known as Stella. She is described as having been "a person of extraordinary endowments and accomplishments of body, mind, and behaviour, justly admired and respected by all who knew her, on account of her many eminent virtues, as well as for her great natural and acquired perfections." Mrs. Johnson died in her forty-sixth year, on the 27th of January, 1728; but this inscription was not placed over her grave till some time after the death of Swift. Another tablet, in one of the corners of the nave, is also interesting from its connexion with this celebrated writer. It is one placed by him over the remains of a favourite servant—Alexander M'Gee, who is stated to have died on the 24th of March, 1722, in the twenty-ninth year of his age.

As in several other of the Dublin churches,—the College Chapel, the Castle Chapel, and the Cathedral of Christ's Church,—the musical part of the church service is performed in this cathedral in a style of extraordinary magnificence. The organ is one of the finest in this country, and was the gift of the second Duke of Ormond, the ship which was conveying it from Rotterdam, where it had been built by the elder Smith, having fallen into the hands of his Grace, in 1702, after an attack on Vigo in Spain, for one of the churches in which city it was intended.

SPIDERS.

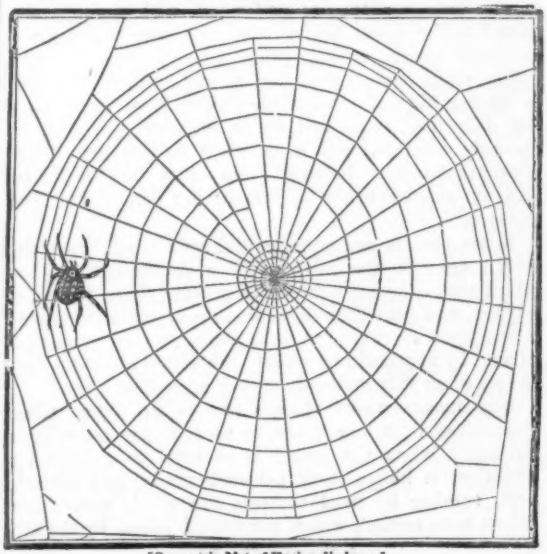
The unamiable character of this insect, its unsightly appearance, and the zeal with which good housewives wage war against it, concur in preventing that general acquaintance with its habits, which its frequent occurrence and domestic and sedentary mode of life render of such easy attainment. The following account, though it adds nothing to the stock of existing information on the subject, affords details which to some of our readers will be new and interesting.

The characteristics of the whole class (*Aranea*), of which the species are many, may be thus stated. All spiders differ essentially in their internal structure from insects proper, and their external form is very peculiar. The feet are always eight in number, instead of six, as in insects, terminated by a moveable hook; the eyes are eight, or, though very rarely, six. The eight eyes of spiders are immovable, and of a structure different from those of insects. As each consists of only one lens, it is deprived of the power of multiplying objects, and, from its immobility, it can only perceive those which are placed immediately before it. The distribution of the eyes differs greatly in different species; but they are always disposed in such a manner as, with their number, to meet the deficiencies indicated, affording a beautiful instance of those "compensations" to which the attention of the student of nature is continually drawn. Spiders do not undergo metamorphoses; and all envelope their eggs in cocoons of silk, varying in form and texture in the different species.

The process by which the web of the spider is woven is always open to observation. There are five spinnerets or teats near the extremity of the abdomen, the apertures of which the insect can contract or enlarge at will. These apertures communicate by a tube with four reservoirs containing the gluey substance of which the thread is spun.

[Garden Spider (*Epeira Diadema*), suspended by a thread proceeding from its spinneret.]

When the common house-spider purposes to form a web, she generally chooses a place where there is a cavity, such as the corner of a room, as well to facilitate her escape in time of danger as for the advantage afforded of more complete inclosure. Having chosen a situation, she fixes one end of her thread to the wall, by applying her spinneret, and then passes to the other side, the thread following her as she recedes. After fixing the other end of the thread to the opposite wall, she returns, and thus passes to and fro until as many parallel threads have been made as she considers necessary, when she begins to cross them by other parallel threads. Thus are formed the toils or snares designed to entangle flies and other small insects. But, besides this large web, she generally weaves a small cell for herself, where she lies quiet and concealed waiting for her prey. This cell is sometimes in the centre of the web, but when not so, a connexion is established by means of threads, which not only inform her, by the agitation communicated to the cell, when anything touches the web, but enables her to pass quickly in order to secure the captive struggling in her toils.

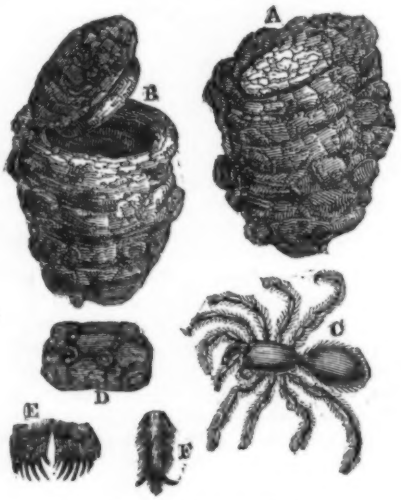


[Geometric Net of Epeira diadema.]

There are other methods of weaving peculiar to different species of spiders, but which our limits will not allow us to enumerate. The second cut in p. 131, exhibits the geometric net of the garden-spider.

Several species of spiders construct a cylindrical web under the ground, with a lid connected by a sort of hinge, which the inhabitant of the cell can open and shut at pleasure. In the volume of 'Insect Architecture' will be found some very curious details of these contrivances of mason-spiders*. The following offers an example of these wonderful exertions of instinct:—

"Another mason-spider (*Mygale cæmentaria*, Latr.), found in the south of France, usually selects for her nest a place bare of grass, sloping in such a manner as to carry off the water, and of a firm soil, without rocks or small stones. She digs a gallery a foot or two in



[Nest of the Mason-Spider.]

A. The nest shut. B. The nest open. C. The spider, *mygale cæmentaria*. D. The eyes magnified. E, F. Parts of the foot and claw magnified.

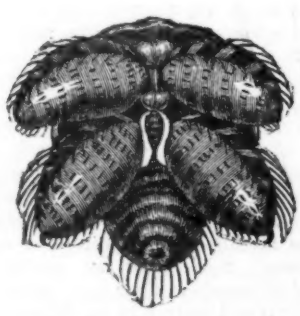
depth, and of a diameter (equal throughout) sufficient to admit of her easily passing. She lines this with a tapestry of silk, glued to the walls. The door, which is circular, is constructed of many layers of earth kneaded, and bound together with silk. Externally it is flat and rough, corresponding to the earth around the entrance, for the purpose, no doubt, of concealment: on the inside it is convex, and tapestried thickly with a web of fine silk. The threads of this door-tapestry are prolonged, and strongly attached to the upper side of the entrance, forming an excellent hinge, which, when pushed open by the spider, shuts again by its own weight, without the aid of spring hinges. When the spider is at home, and her door forcibly opened by an intruder, she pulls it strongly inwards, and even when half-opened often snatches it out of the hand; but when she is foiled in this, she retreats to the bottom of her den as her last resource."

Some spiders are aquatic, and spin a cup-like web, which answers the purpose of a diving-bell, under which they disengage the air they bring down from the surface, and pass their lives feeding on aquatic insects. Some spin no web, but take their prey by running; others, by approaching quietly till within a certain distance, when they suddenly spring upon their prey.

The means which spiders employ in transporting themselves from one place to another are not a little curious. When the insect is inclined to change its situation, it hangs itself perpendicularly by a thread, and, turning its head towards the wind, shoots out others from behind, which are wafted about by the air, until they fasten on trees, walls, and other bodies. When the spider finds that the threads have attached themselves, which it ascertains by pulling them in with its feet, it uses them as a bridge to pass to the place where they are fixed. Such threads are frequently seen running, parallel to the horizon, from one wall to another in a house, from one tree to another in a field, and even from wall to wall across gardens of considerable extent. That spiders had the means of floating through the air appears to have been first ascertained by Dr. Lister and Dr. Hulse towards the latter end of the seventeenth century. After the insect has, in the manner just described, thrown out one or more threads to the length of several fathoms, it snaps that from which it hung, and then floats away with the wind; and although, of course, it cannot proceed against the wind, it seems to have some control over its own course, using its feet in the way of oars to steer, and perhaps, in some measure, to row. Many theories have been attempted for the explanation of this phenomenon; amongst others that it depends upon the electrical state of the atmosphere.

The height to which they can attain is very surprising. In a letter to Mr. Ray, Dr. Lister mentions that, in October, 1670, he observed the air to be very full of these webs, and immediately ascended to the top of the highest steeple of York Minster, and could there observe them still very high above him. Autumn is the principal season for these aërial voyages, though they are occasionally undertaken at other times in clear and calm weather. As these floating webs are, like those in the lower regions, frequently garnished with legs, wings, and other marks of slaughter, it is concluded that the spiders capture gnats and other insects in their passage. In all stages of their existence, spiders prey with the most savage ferocity on all insects they can overcome, and also upon one another. Spiders seize and kill their prey with a pair of sharp, crooked claws, or forceps, placed in the fore part of the head. They can open or extend these pincers as occasions require; and, when undisturbed, they suffer them to lie one upon another. It is affirmed that the spider injects a poisonous juice into the wound it makes. They cast their skins once a-year, and they perform this operation by suspending themselves in some corner, and creeping out of their case. These skins are found in the webs dry and transparent, with the legs attached to them.

It should be observed that the apertures in the spinnerets of the spider, from which the viscid matter which forms the web is emitted, are exceedingly numerous. M. Réaumur often counted 70 or 80 in a single teat by means of a microscope, and could perceive that there were infinitely more than he could enumerate. It is computed that there are about 1000 apertures in each teat, and, as there are five teats, each thread of the spider consists of 5000 separate fibres, which are united at a very minute distance from the teats.



[Spinnerets of a Spider magnified to show the Spinnerules.]

To give an idea of the wonderful tenuity of the

* See page 360, &c.

thread of the full-grown insect, it has been computed that an ordinary human hair is as large as 10,000. But this is not—

"The spider's most attenuated thread;"

for the young begin to spin as soon as they leave the egg; and how fine must the thread be which is drawn from the minute apertures in the teats of insects whose whole bulk does not equal that of a single teat of the mother! Leeuwenhoek calculates that, when the young spiders first begin to spin, 400 of them are not larger than one of full growth; we may therefore presume, on the data of the preceding computation, that 4,000,000 of such threads do not exceed in bulk a single human hair.

About the beginning of the last century, M. Bon, of Languedoc, having observed that a short-legged species of garden-spider enclosed its eggs in bags composed of threads of much thicker and stronger texture than those which form the web, was led to think that they might be manufactured into a kind of silk. On making the experiment, he found that the threads could not be wound off, and he therefore had them carded with unusually fine cards. A silky substance of an ash colour was thus obtained that was easily spun into fine and strong threads, which M. Bon caused to be manufactured into gloves and hose, and found that three ounces of this material would make a pair of stockings for a large man whose common silk stockings weighed between seven and eight ounces. The result of M. Bon's experiment, and the actual production of the manufactured articles before the Royal Academy of Sciences, led to very sanguine expectations of the benefit which might be derived from these insects. But M. Reaumur, who was appointed by the Academy to investigate the subject, made a report which completely discouraged the expectations which had been raised. He stated that the natural ferocity of the spiders renders it impracticable to breed and keep them together. He distributed 4000 or 5000 into different cells, in numbers varying in each cell from 50 to 200, and fed them with flies and the bloody ends of young feathers; but the smaller insects were soon devoured by the larger, so that in a short time there were but one or two left in each cell. To this disposition in spiders of devouring one another, M. Réaumur attributes their comparative scarcity, considering the vast number of eggs they lay. It is thus impossible to establish the insects in a community; and, if it were practicable, more room and attention would be required than the produce would recompense. A much greater number of spiders than of silkworms would be necessary to produce the same quantity of silk; and the bag of the spider is, after all, much inferior to that of the silkworm both in lustre and strength. M. Réaumur computed that 2304 worms will produce a pound of silk; and, as he considers the work of twelve spiders only equal to that of one silkworm, a pound of silk would require 27,648 spiders; and as the females only form the bags to deposit their eggs in, he supposes it would be necessary to have an equal number of males, so that, in order to obtain a quantity of silk equal to that furnished by 2304 silkworms, it would be requisite to keep 55,296 spiders.

THE BEDFORD LEVEL.

The Bedford Level is a vast tract, containing about 400,000 acres of low land, extending into the six counties of Northamptonshire, Huntingdonshire, Cambridgeshire, Lincolnshire, Norfolk, and Suffolk, bounded on all sides by high lands, which encompass it almost in the form of a horse-shoe. Peterborough Fen*, which is that part of the Level running into Northamptonshire, and extending between Peterborough and Crowland, contains between 6000 and 7000 acres. One-seventh part of the Level is situated in Huntingdonshire. Nearly the whole of the Isle of Ely, which forms the northern division of Cambridgeshire, consists of this marshy ground. The south-east part of Lincolnshire,—usually termed Holland,—extending to the river Witham on the north, is a fenny district included in the Bedford Level: 63,000 acres are situated in Norfolk and 30,000 in Suffolk.

There is abundant evidence to prove that this part of the country was formerly dry land, at a much lower level than the present surface. From the convulsions of nature, and subsequently owing to embankments improperly made, which prevented the waters from the uplands flowing into channels through which they might discharge themselves into the sea, the tract was at length reduced to the state of a morass, where the waters, stagnating and becoming putrid, produced miasma destructive to the health of the inhabitants; while this extensive district became impassable even to boats, in consequence of the sedge, reed, and slime with which it was covered. It is conjectured, with every appearance of probability, that this Level was, at the time of the invasion of the Romans, one of those great forests to which the Britons fled for protection against their conquerors, whose policy it was to cut down the trees, and to render bare those retreats and strongholds of the natives.

History records the heavy grievances of the Britons, who complained that their hands and bodies were worn out and consumed by the Romans, in clearing the woods and embanking the fens. The Roman emperor, Severus, who died in the beginning of the third century of the Christian era, was the first who intersected these fens with causeways. One of these was twenty-four miles long, extending from Denver, in Norfolk, to Peterborough. It was sixty feet broad, composed of gravel three feet in depth. This causeway is now covered with moor, from three to five feet in thickness. At that early period this low land, though damp, was by no means impassable; on the contrary, it appears that, up to the thirteenth century, the waters here usually flowed in natural channels, and had not devastated the surrounding country. Henry of Huntingdon, who wrote in the time of King Stephen, describes this fenny country as "very pleasant and agreeable to the eye,—watered by many rivers which run through it,—diversified with many large and small lakes,—and adorned with many woods and islands." William of Malmesbury, who lived about the same period, also represents it as a perfect paradise, "the very marshes abounding in trees whose length, without knots, do emulate the stars." There was then no waste land in any part. On some spots there were apple-trees; in others, vines, which either spread upon the ground or ran along poles.

Dugdale relates, on the authority of historians writing at the time in which the event happened, that in the year 1236, on the morrow after Martinmas Day, and for the space of eight days more, the winds were so boisterous that the sea was raised much higher than its usual bounds, and broke in at Wisbeach and other places of this district, so that many people and cattle, together with numerous small craft, were destroyed; and those of the inhabitants who survived were reduced to great distress. About seventeen years after this disaster, a similar accident again happened; and the inhabitants were called upon, by command of the king, to repair the banks. This compulsory work was performed but very inefficiently, for, within a few years, the sea-banks were again broken by the violence of the tides.

* *Fen*, in the old English or Saxon language, signifies dirt or mud.

In the progress of draining the district, evidence has every where been found not only of previous vegetation, but that this spot had formerly been an inhabited country, which must have been suddenly overwhelmed by some violent convulsion of nature. In digging a little above Boston, in the year 1764, for the purpose of driving piles in the solid bottom, roots of trees were found at the depth of eighteen feet below the then pasturage surface, and these roots were so firm in the ground that some of them were obliged to be chopped to make room for piles. In making several channels for draining the isle of Axholm* great numbers of oak, fir, and other trees, were found lying in the moors, the fir from four to five feet deep, the oak about three feet below the surface. They were discovered lying near their roots, which still stood as they grew in firm earth below the moor. The bodies had fallen generally in a north-west direction from the roots. Their appearance indicated that they had not been dissevered by the stroke of the axe but had been burnt asunder near the ground, the ends still presenting a charred surface. The oaks were lying in multitudes, and of an extraordinary size, some being five yards in circumference and sixteen yards long; others smaller, but of a great length, with a large quantity of acorns near them. Similar discoveries were made near Thorney, near Lynn, and in many other places.

When Sir R. Cotton was having a pool made at the edge of Conington Downs, Huntingdonshire, in the course of excavation the skeleton of a large sea fish was found considerably beneath the surface of the soil. In 1635 a deeper channel was made to the Wisbeach river, and eight feet below the then bottom, another hard stony bottom was found, on which were lying seven boats covered with silt. On digging through the moor at Whittlesey, in the Isle of Ely, for the purpose of making a moat, at the depth of eight feet a perfect soil was found, with swaths of grass lying on it as they were first mowed. At Shirbeck sluice near Boston, a smith's forge was discovered buried sixteen feet deep; the remains of several ancient tan-vats were likewise found, besides a great quantity of horns, and some shoe soles of a very unusual form, being sharp-pointed, in the fashion of those worn in the reign of Richard II.

In 1436, the project of draining these fens engaged the attention of many persons of wealth and consideration in the country. Vast funds were expended in making ditches and banks impregnable, as it was supposed, to all assaults from inundations; but the next winter being wet and windy, the river Ouse, with the accession of its tributary brooks, swelled into a mighty torrent, and swept away all the bulwarks opposed to its progress. This accident is thus described in the quaint words of the narrator:—"Down comes the bailiff of Bedford, attended like a person of quality with many servants, and breaks down all their paper banks, as not water-proof, reducing all to their former condition." The total demolition of works, which were thought so excellent in design and execution, induced the speculators of that and succeeding ages to discuss the feasibility of the project, and many curious arguments were brought forward for and against the undertaking; an account of some of these may not, perhaps, be uninstructive.

Some narrow-minded persons objected to the attempt on the plea of religion, as if it were displeasing in the sight of the Creator for his creatures to exercise the patience and ingenuity with which they have been endowed by Him. It was said, "Hitherto shalt thou come, and no farther," and it was therefore mistrusting God's providence for man to presume to set any other bounds to the water than those which "God hath appointed." On the other hand it was urged, that this objection only held good with regard to the ocean, "which is a wild horse, only to be broke, backed, and bridled by Him who is the maker thereof. It was a false and lazy principle if applied to fresh water, from the attacks of which, to defend the soil, human industry might be exerted with perfect propriety."

Another argument of the non-speculators was, that many had attempted, but none succeeded, in arresting this mighty assailant. "None even wrestled with it but it gave them a foil (if not a fall) to the bruising (if not breaking) of their backs. Many have burnt their fingers in these waters, and instead of draining the fens have drained their pockets." To this it was answered, that the frequent failures in the undertaking did not prove its impracticability, but only the want of ability in design and execution.

A worthy alderman of Cambridge likened the fens to a crust of bread swimming in a dish of water, as, under a depth of eight or ten feet of earth, the whole was nothing, he said, but mere water. The draining thereof was therefore impossible. It was affirmed by his opponents that interest had betrayed his judgment into an evident error, and that his brain, rather than this floating earth, seemed to swim. The savans of Cambridge then urged that the Cam would have its stream dried up by the draining of the fens; and as Cambridge is concerned in its river, so the well-being of the whole country, yea, of the whole kingdom, is concerned in Cambridge and its University, and the stream of knowledge would be dried up with the stream of Cam. It was, therefore, not reasonable that private men's particular profit should be preferred before a universal good,—or the good of a university. Assurances were given that no damage should accrue to the river Cam; on the contrary, "to take away the thief is not wasting nor weakening the wick of the candle."

Those who professed to be the poor man's friends brought forward other objections. They said, that the fens were nurseries and seminaries of fish and fowl which would be destroyed by the draining; that the sedge, turf, and reed would likewise be destroyed, and that many thousand people then gained their livelihood by fishing and fowling in the fens, while the turf furnished fuel for the poor. The answers to these objections were forcibly though quaintly put. It was said, that a large first course, at any man's table, compensates for his shorter second course; and who would not prefer a tame sheep before a wild duck, and a good fat ox before a well-grown eel; while the people employed might turn their industry to a more profitable account. The sedge, &c., would be replaced by good grass and grain. He cannot complain of wrong who hath a suit of buckram taken from him and one of velvet given instead thereof.

A parallel to this objection is stated by Sir John Herschel to exist at the present day in Holland. The great Haarlem Lake, which covers a surface of 40,000 acres, might easily be drained, and Sir John has made a calculation* to show the practicability of the undertaking through the employment of pumps worked by means of steam-engines. "Eight or nine thousand chaldrons of coals," says he, "duly burnt, would evacuate the whole contents. But many doubt whether it would be profitable, and some, considering that a few hundred fishermen, who gain a livelihood on its waters, would be dispossessed, deny that it would be desirable."

It was then asserted, that even if these marshes could be drained, after vast difficulty and expense, they would quickly revert to their old condition, like the Pontine marshes in Italy: the speculators, on the other hand,

* The Isle of Axholm is on the north-west of Lincolnshire, and is included by the rivers Trent, Idle, and Dun.

* 'Discourse on the Study of Natural Philosophy,' pp. 61, 62.

urged that moderate care would prevent this catastrophe. Well, said the objectors, grant them drained, where would be the advantage? the rich man would jostle out the poor from their commons. Wherefore, it was answered, was this a necessary result? why should oppression be an essential accompaniment to draining or enclosing? an equitable allotment would be made which would benefit the poor as well as the rich.

All these arguments fully impressed the generality of people with the opinion that the project was impossible, and that it was only an idle dream of fanciful speculators. Perseverance and experience, joined to skill and ingenuity, have, however, brought to a successful issue many schemes which have been deemed impossible; and much rich and productive land, by these united powers, have, in this instance, been brought into successful cultivation. Where the wild-fowl and the fish once held undisputed sway, now graze in luxuriant pasturage the ox and the sheep; where the reed lifted its profitless head, now waves the golden harvest; the industry of man has reclaimed a great part, and is still constantly reclaiming more, of this once unhealthy and unprofitable morass. It would much exceed our present limits to give a detailed account of the various means taken to accomplish this arduous work. In the reign of Charles I., in the year 1634, William Earl of Bedford* undertook to drain these fens, stipulating to receive, as a compensation for the expense and trouble incurred, 95,000 acres of the reclaimed land: 100,000*l.* were expended in the course of three years in this endeavour, and the work was partially accomplished; but the embankments proved defective, and the whole was again allowed to lay waste until the year 1649, when the Earl once more attempted the task for his former share of 95,000 acres. Three hundred thousand pounds were then laid out in draining, embanking, &c., and this time with success, as far as regarded the accomplishment of the work, but to the ruin of those who had been admitted sharers, since the sum expended was much more than the 95,000 acres were worth.

A regular system for continuing the draining and preserving the land already reclaimed, was now established; and, in 1664, a company was incorporated for its management: this consisted of one governor, six bailiffs, and twenty conservators; and, to the present day, the fens are managed and preserved by this corporation. Numerous cuts have been made, intersecting every part; some of these are so large and deep as to serve for navigable canals. In the Isle of Ely, the Old and New Bedford rivers are two cuts running nearly parallel to each other;—these are both navigable for upwards of twenty miles from Erith to Denvers. Various expedients are used for the proper draining of the marshes: where the regular and common means have failed, windmills have been erected which raise the water to the requisite height to admit of its being conveyed to receptacles sufficiently elevated, by which it may be carried off into its proper channel. These numerous windmills give a strange aspect to the Isle of Ely, where the towns and villages are built on the most elevated spots, which appear like islands rising from amidst low and wet marshes. Recourse has been had to numerous projects to complete and secure the drainage of the fens; and a vast expense has been incurred, sometimes much greater than the value of the land reclaimed. In Huntingdonshire, about the latter end of the last century, the tax raised on the land by the conservators, for its drainage and the preserving of its embankments, was in some instances so great, that the farmers preferred forfeiting their land rather than paying so exorbitantly for its preservation. In the present day, the art of drainage is better understood than when first this stupendous work was undertaken; but even now, in many places, the farmer is still liable to have the produce of his grounds carried away by sudden inundations. The peculiar situation of the Level renders it the receiver of the waters of nine counties, and therefore it is difficult to provide a sufficient outlet to the sea by which the descending torrent may find a safe egress. The great error committed in the commencement of the drainage was the making numerous small cuts instead of larger and deeper channels, by which, with the same inclination of descent, the water would safely pour into the sea without any risk of overflowing its banks; since in a narrow and shallow channel, owing to the smaller force exercised by the lesser body of water, the bottom must be made at a much greater inclination to cause the free flowing of the stream. Great improvements are now, however, constantly being made in the drainage and embankment of this extensive tract of land, and the errors of former methods are, as far as possible, being remedied.

The late Mr. Nimmo, in an excellent paper on draining inserted in 'Brewster's Edinburgh Encyclopedia,' gives the following data on the subject of the relative inclination of streams necessary to insure the discharge of their waters:—

"Large and deep rivers run sufficiently swift with a fall of about one foot per mile, or ..... 1 in 5000
Smaller rivers and brooks run sufficiently swift with a fall of about two feet per mile, or ..... 1 in 2500
Small brooks hardly keep an open course under four feet per mile, or ..... 1 in 1200
Ditches and covered drains require at least eight feet per mile, or ..... 1 in 600
Furrows of ridges and filled drains require much more."

* Whence it derives its name of the "Bedford Level."

SCRATCHELL'S BAY, ISLE OF WIGHT.

The old topographical poet, Michael Drayton, says justly of the Isle of Wight, in his many-footed verses,—

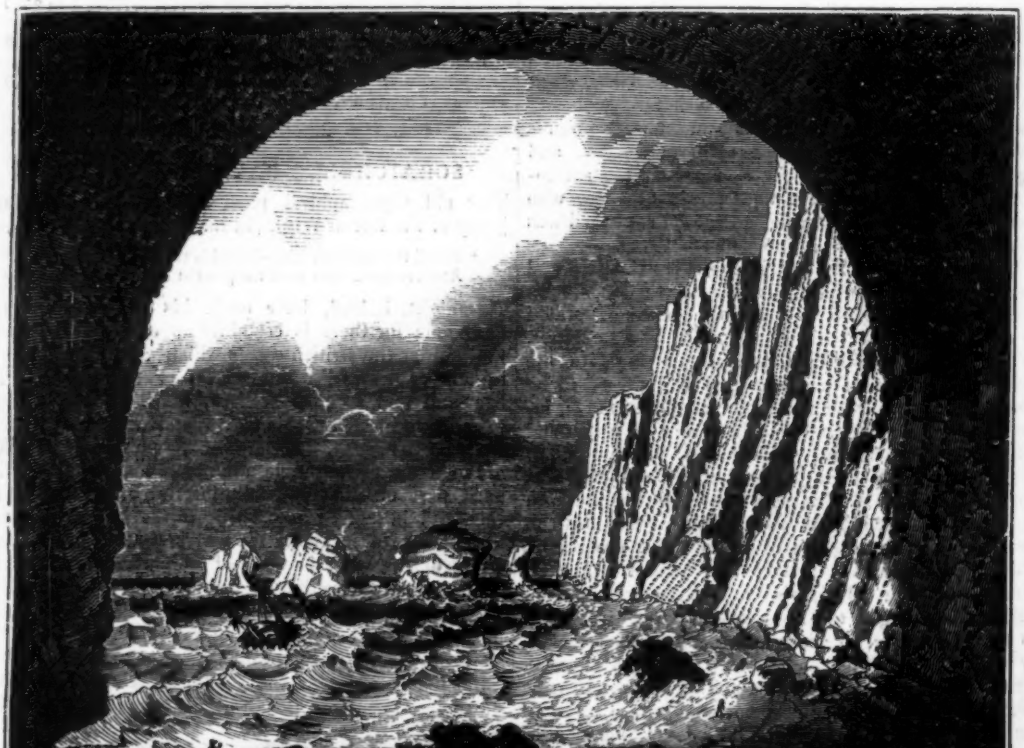
"Of all the southern isles she holds the highest place,
And evermore hath been the great'st in Britain's grace."

He might, indeed, have made his eulogy more unqualified; for there is certainly no other of the islets that border the British coasts which can pretend to vie in any respect with this "gem of the ocean." In beautiful and sublime scenery, much of it of a kind peculiar to itself, the Isle of Wight is surpassed by few spots on the globe. A considerable portion of its coast presents an impregnable rampart, composed for the most part of cliffs of chalk, intermixed with flint or clay, and in many places rising to the height of some hundreds of feet above the waves that lash its base. Some of the most elevated of these rocks occur in the course of the range that extends in both directions from the west point of the island, forming Alum Bay to the north, and what are called the Freshwater Cliffs to the south. An indentation, much smaller than Alum Bay, immediately adjacent to this terminating promontory on the south side, is known by the name of Scratchell's Bay. It is represented in our wood-cut to the right, as seen, along with the other objects to the west of it, from the front of the cave, the magnificent arch of which, 150 feet in height, forms the foreground of the picture. This is one of numerous caves which pierce the Freshwater Cliffs, and vary the extraordinary aspect of that vast wall of whiteness marked with parallel inclined lines of black, "only to be compared," to use the language of Sir Henry Englefield, "to a ruled sheet of paper." In many parts these cliffs are 400 feet in height;—at one place, called Main Beach, their elevation is not less than 600 feet. Here, however, the precipice is not quite perpendicular. The singular-looking rocks that are seen rising out of

the water beyond the promontory are the celebrated Needles, a name, however, which they seem to have derived chiefly from one of their number, much taller than any of those now remaining, which has long disappeared. It fell suddenly in the year 1764. Sir Richard Worseley, in his 'History of the Isle of Wight,' states, that it was about 120 feet in height above low water mark, and much more like a needle in shape than any of those that now remain. A representation of the Needles, as they formerly appeared, is given in that work.

Scratchell's Bay, and all the neighbouring cliffs, are frequented by vast swarms of sea fowls, which the country people are in the habit of catching by the hazardous method, practised also in the Shetland and the Feroe Islands, of being swung over the brow of the rock by a rope made fast in the earth above. Worseley enumerates puffins, razorbills, willocks, gulls, cormorants, Cornish choughs, daws, starlings, and wild pigeons, as among the species that frequent the rocks, and lodge in the shelving strata. Some remain constantly here; others come only to lay their eggs. "They sit," says the writer just quoted, "in thick rows, and discover themselves by their motions, though not individually visible." From these retreats they are driven or frightened away by the stick of the adventurous bird-catcher. When Worseley wrote (1781), the soft feathers obtained from a dozen birds were sold for eightpence; and the carcasses were then disposed of, at the rate of a halfpenny each, to fishermen, who used them for bait to their crab-pots.

Scratchell's Bay is often visited by tourists. The most magnificent view down into it, Sir Henry Englefield says, is obtained by descending a very steep grassy slope, to the edge of one of the cliffs in the neighbourhood, and from this point the whole of the Needles may be seen; but he advises strangers not to attempt to find their way down without taking a guide along with them. In his splendid folio, entitled 'A Description of the Isle of Wight,' (London, 1816,) Sir Henry has given various views of the scenery in the neighbourhood of this spot. "Nothing can be more interesting," he remarks, "particularly to those who take pleasure in aquatic excursions, than to sail between and round the Needles. The wonderfully coloured cliffs of Alum Bay, the lofty and towering chalk precipices of Scratchell's Bay, of the most dazzling whiteness and the most elegant forms, the magnitude and singularity of the spiry, insulated masses, which seem at every instant to be shifting their situations, and give a many perplexity to the place, the screaming noise of the aquatic birds, the agitation of the sea, and the rapidity of the tide, occasioning not unfrequently a slight degree of danger, all these circumstances combine to raise in the mind unusual emotions, and to give to the scene a character highly singular, and even romantic."



[Scratchell's Bay and the Needles.]

*** The Office of the Society for the Diffusion of Useful Knowledge is at 59, Lincoln's Inn Fields.
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